

LEAN GLOSSARY

Activity Process Map: One of the detailed flowcharts or process maps—a picture of the sequence of steps in a process in which different steps are represented by boxes or other symbols. Used to map the detailed steps of a process, often captures decision points, rework loops, complexities, bottlenecks, etc., and to document standardized work practices.

Andon: See Status Signaling.

Autonomation (Auto-Stop or Jidohka): See Auto-Stop.

Auto-Stop (Autonomation or Jidohka): Name for some shutdown devices; means “automation with a human touch” because workers can quickly determine the problem and make corrections to resume working when a machine or process stops because of defects. This is one of the approaches in the Improve Daily Work step in the Lean Pathway.

Breakdown: Occurs when machine, equipment, or resource pools break down, requiring more than routine repairs or significant intervention to get things working again. It is one of the causes of downtime. Typically, this refers to downtime of more than 10 minutes. Some examples include a motor burning out on equipment, laborers going on strike, and a computer system in a call center going down.

Cause-and-Effect Diagram (Ishikawa Diagram): A tool used to identify and organize possible causes of a problem in a structured format, showing the relationships between potential causes. Sometimes, it is called a fishbone diagram because it looks like the skeleton of a fish, or an Ishikawa diagram after the man who invented it.

Changeover: The time it takes to stop current production or processing and start a different production run or procedure, or switch to a different project or unit; includes setup and adjustment time. Examples include time to adjust to a new software application and time to adjust equipment settings for a new run.

Charter: A written description of the project or event that describes the work of the team; includes the current situation, resources, importance, scope, and measures, and serves as the primary tool communicating requirements from authorizers to the team.

Combination Work Table: A table that combines human movements with the operation. Documents takt time, cycle time, walk time, wait time, work while walking, and machine time. Used to identify and analyze the waste of motion and waste of waiting in the scope and sequence of work.

Control Chart: A time plot or graph of data in time order that includes a centerline and upper and lower statistically calculated control limits. The limits allow you to quickly detect specific types of changes in the process. Used to detect and monitor process variation and performance over time.

LEAN GLOSSARY

Control Device: A type of error-proofing device that does not allow the task to be completed or the part to be made incorrectly; deals directly with the causes of errors or defects and has the ability to process items by their characteristics (e.g., dimension, shape, weight, volume, characters entered). Some examples include cars that do not start unless they are in park, a computer screen that will not advance until all required fields are completed, and scanning barcodes at the register to prevent manual entry errors.

Conveyance Waste: Movement and transportation of material, product, or information not absolutely necessary to meet customer requirements; a form of waste. Examples include moving stock or materials long distances to the point of use and people driving separately to a jobsite when they could have gone together.

Correction Waste: Having to do an activity over because it was not done correctly the first time; a form of waste. Some examples include scrap, errors, and rework.

Cycle Time: The time that elapses between one output being completed by the process step and the next; includes operating time plus the time required to prepare, load, and unload. If cycle times for all operations or process steps are within process pulse time, overall production and processing will flow smoothly and uniformly.

Cycle Time Worksheet: A worksheet used to track where time is spent in the process; used to identify time spent by category in order to identify waste, such as overprocessing, correction, and waiting.

Data Collection Checksheet: A basic form that helps collect data by providing specific spaces where the data can be recorded; used to standardize data collection for almost any type of data.

Data Tools: A set of tools used to better understand and address problems in daily work; used to collect and display data on process performance and time, and to analyze root causes. Data tools to collect and display process performance include the data collection checksheet, Pareto chart, frequency plot, and control chart. Data tools to collect and display process time include the cycle time worksheet and combination work table. A cause-and-effect diagram is the tool for analyzing root causes. These tools are used as part of the Improve Daily Work step of the Lean Pathway.

Deployment Process Map: One of the detailed flowcharts or process maps. A tool used to map the detailed steps of a process and which people or groups are involved in each step. This map is often used to document standardized work practices.

Downtime: The time a process is not available to run due to planned or unplanned equipment or resource failures.

Efficiency Calculation (Overall Equipment Efficiency – OEE): A measure to assess efficiency of equipment or a resource pool; focuses on availability of equipment or

LEAN GLOSSARY

resource, performance speed, and rate of quality products or services produced. One of the approaches in the See the Waste step of the Lean Pathway, the calculation is represented as:

Efficiency = Availability x Performance Speed x Rate of Quality Products/Services.

Error Proofing (Poka Yoke): The process of reducing/eliminating mistakes made in an operation or process. An example is a product design with physical shapes that make it impossible to install parts in any but the correct orientation. One of the approaches in the Improve Daily Work step of the Lean Pathway.

Failure Mode and Effects Analysis (FMEA): A tool that anticipates and analyzes potential problems so that countermeasures can be taken to reduce or eliminate risks; typically used in product or service design, process execution, and analysis of potential human errors. It identifies specific ways in which a product, process, or service may fail, and develops countermeasures targeted at specific failures that will improve performance, quality, reliability, and safety.

5S: A simple checklist approach to organizing the workplace and focusing on safety. Each “S” relates to a Japanese word associated with organizing, translated as: 1) sort; 2) straighten; 3) sweep, wash, clean, and tag abnormalities; 4) standardize; and 5) sustain. Also called workplace organization, in most organizations, this is the foundation for improvement activities. This is one of the approaches in the Prepare the Workplace step of the Lean Pathway.

5S Action Plan: A simple matrix indicating actions and outcomes for each of the 5S categories; used to help implement organization and safety improvements based on 5S.

Five Whys: A technique of identifying a focused problem and asking “why” five times until the root cause(s) are articulated.

Flow: The state when the system is functioning at optimum levels. Products and services flow through the value stream from conception to launch and from order to delivery with no interruptions, stoppages, scrap, or backflows.

Frequency Plot: A plot that shows the shape, or distribution, of the data by showing how often different values occur. Used for numerical data, this shows how the data is distributed and includes bars, columns, or stacks of data points to represent how frequently a particular measurement or range of values appears.

Heijunka (Sequencing or Production Leveling): See Sequencing.

Human Mind Waste: A form of waste that does not involve the person doing the job, the real expert, thereby missing opportunities for improvement and resulting in poor quality and higher costs. Some examples include not listening, not acting on ideas to eliminate waste, and not providing people with the knowledge needed to do the work.

LEAN GLOSSARY

Integrated Maintenance (Total Productive Maintenance – TPM): An approach that ensures optimum reliability and efficiency of machinery and equipment, and recognizes that proper maintenance of equipment is essential, including preventing defects and breakdowns. Some examples include refinery operators trained to detect problems with pumps and motors, bank tellers performing simple maintenance on keyboards and printers, and field sales reps downloading security updates for proprietary software and operating systems on a weekly basis. This is one of the approaches in the Address Setup and Maintenance step in the Lean Pathway.

Inventory Waste: A form of waste that involves maintaining extra inventory or work in process beyond what is needed to meet normal demands. Examples include waiting until sufficient work volume accumulates to begin working (batching) or taking more supplies from storage than needed.

Ishikawa Diagram (Cause-and-Effect Diagram): See Cause-and-Effect Diagram.

Jidohka (Auto-Stop or Autonomation): See Auto-Stop.

Just-In-Time (JIT): Producing and delivering the right parts/items/services in just the right amount at just the right time. All upstream and downstream tasks are balanced and choreographed into a perfect sequence, eliminating the need for excessive inventories or work-in-process throughout the process.

Kaizen (Lean Event): See Lean Event.

Kanban (Pull Signal): See Pull Signal.

Lead Time: The total time for the product or service to move through the entire value stream, from customer order to when the product or service is delivered to the customer. This includes the cycle time of all operations or processes, plus all wait and delay time before, between, and after processes.

Lean: A rigorous methodology for identifying and eliminating waste and its drivers in processes and increasing customer value. The goal of Lean is to produce the **right amount** (based on demand) of **high quality** products and services (as defined by your customers) with the **least amount of time, effort, and cost**. The terms in bold reflect the emphasis that Lean places on (1) understanding customer requirements, (2) pacing the workflow so that you neither over- nor underproduce, and (3) critically examining a process so you can identify anything that either harms quality or adds waste.

Lean Event (Kaizen): A group activity, typically lasting 4 – 10 days, in which a team identifies and implements a significant improvement in a process. The event represents one cycle of continuous improvement and is the foundation of improvement activities in a Lean organization.

LEAN GLOSSARY

Lean Event Storyboard: A graphic or pictorial record of a Lean event.

Lean Pathway: A five-step model to guide and help speed up the implementation of Lean in an organization. The five steps include: 1) See the Waste; 2) Prepare the Workplace; 3) Improve Daily Work; 4) Address Setup and Maintenance; and 5) Make Value Flow Faster.

Load Leveling: Assigning the work and personnel in such a way that each operation can complete one unit within the allotted process pulse time, then working to reduce variation in times between steps so that overburden, unevenness, and waste of idleness are minimized. This is one of the approaches in the Make Value Flow Faster step of the Lean Pathway.

Motion Waste: A form of waste where movement of people, equipment, or machinery does not contribute value to the end product or service. Examples include a misplaced or lost file that someone has to take time to look for, and the wrong tools/equipment brought to a worksite causing someone to go back to get the right tools/equipment.

Muda (Waste): See Waste.

Mura (Unevenness): See Unevenness.

Muri (Overburden): See Overburden.

Non-Value-Added Work (NVA): Work that adds no value to the product or service provided to customers. This type of work should not be done, is not necessary to advance the process, since it adds cost, customers do not want to pay for it. Examples include defects, delays, waiting, and inventory.

One-Piece Flow: The key element of just-in-time processing or production. Only one piece of work is allowed to flow from process to process. It is a state where the process flows smoothly, one piece at a time, the workload is level and steady, and each unit is processed without delay. This is one of the approaches in the Make Value Flow Faster step in the Lean Pathway.

Operation Analysis Worksheet: A worksheet that shows the sequential steps of an operation or process, as well as a sketch, picture, or diagram of the operation or process; used to document the work process and work sequence.

Organization and Safety: Principles that focus on organizing the workplace and operating safely; includes getting rid of everything that is not needed, arranging tools, files, forms, materials, equipment, etc., standardizing the workplace, keeping the workplace tidy, and designing for safe human movement. This is one of the approaches in the Prepare the Workplace step of the Lean Pathway.

LEAN GLOSSARY

Other Necessary Work (Required Work): Work that does not directly add value to the product or service provided to customers, but is necessary to advance the process. Customers do not want to pay for it, nor do they care that it is being done. Some examples include regulatory, legal, and reporting requirements.

Overall Equipment Efficiency (OEE or Efficiency Calculation): See Efficiency Calculation.

Overburden (Muri): The overextension of the capacities of people, equipment, and machines and one of the major drivers of waste. Examples include a process step that runs at a pace harder than can be maintained and still achieve safe, consistent results, and one piece of equipment that works beyond its design capacity (i.e., higher volumes, faster rates.)

Overprocessing Waste: A form of waste; unnecessary work that does not add value to the product or service. Some examples include adding product features that do not increase value from the customer's perspective, overservicing equipment, and performing extra unnecessary steps in a process.

Overproduction Waste: A form of waste that involves delivering more products or services than required; production or processing that is done at a faster rate than required to meet customer demands. Some examples include running equipment at higher speeds, hiring more people than necessary, and overestimating in the budgeting process.

Pareto Chart: A graphic tool for visualizing categorical data to understand the pattern of occurrence for a problem, judge the relative impact of various parts of a problem, track down the biggest contributors to a problem, and decide where to focus efforts.

Poka Yoke (Error Proofing): See Error Proofing.

Process Pulse (Takt Time): The amount of time allocated to produce one unit based on customer demand; used to synchronize the process and establish the measure for uniform production flow. It is calculated by taking the process time per work period and dividing it by the total number of units required by the customer during that time period. If, for example, an application processing center performs 480 minutes per day and customer demand is 24 applications per day, process pulse time is 20 minutes ($480/24 = 20$)—every 20 minutes an application should be processed. If all operations or process steps are within process pulse time, overall production and processing will flow smoothly and uniformly. One-piece flow will work when each task is completed within the process pulse. This is one of the approaches in the Make Value Flow Faster step in the Lean Pathway.

Production Leveling (Sequencing or Heijunka): See Sequencing.

Pugh Matrix: A tool that ranks alternatives against a baseline; used to help select the best option or solutions among alternatives.

LEAN GLOSSARY

Pull: A system where downstream processes pull work from upstream processes. Nothing should be produced until it is needed or wanted downstream (just-in-time). The customer pulls the product/service so only what is needed is produced. This is one of the approaches in the Make Value Flow Faster step in the Lean Pathway.

Pull Signal (Kanban): A signboard or card used as a visual control tool to signal pull; serves as a work order, describes what to produce, when and how, and moves with the material.

Rapid Changeover (Single Minute Exchange of Die – SMED): Performing changeovers or operations setup and adjustment in less than 10 minutes (many organizations have set more stringent targets of “zero changeover,” which is 3 minutes or less). Examples include minimal time to start up and switch over between computer applications, and quick changeover of equipment from producing automotive side panel A to B. This is an approach used in the Address Setup and Maintenance step in the Lean Pathway.

Selection Matrix: A simple, logical tool that evaluates alternatives against criteria for selection; used to help select the best option or solution from among alternatives and to show other stakeholders how the final choice was made.

Sequencing (Production Leveling or Heijunka): The equalization of quantities and types of products or services within the process based on customer requirements over a fixed period of time; based on producing the quantity taken by one process from the process that immediately precedes it. The processes are arranged to facilitate just-in-time production: the required amount at the required time with people and equipment organized to that end. An example is producing multiple product lines from one production process and mixing the types of products based on each of their demand (i.e., produce 5 of product A, 3 of product B, and 10 of product C, then repeat that sequence). This is one of the approaches in the Make Value Flow Faster step in the Lean Pathway.

Shutdown Device: A type of error-proofing device that has the ability to stop when a defect is identified. Examples include ATM machines deactivating an account after an incorrect password is entered three times and coffee pots and irons shutting down after one hour without use.

Signaling Pull: A method for replenishing inventory or work based on actual usage. Parts, materials, information, or units of work are moved through production or processing via a pull signal or kanban, supporting one-piece flow, allowing operations to turn their inventories often, helping to eliminate huge inventories, and relying on actual customer demand, not forecasts. This is one of the approaches in the Make Value Flow Faster step in the Lean Pathway.

Single Minute Exchange of Die (SMED or Rapid Changeover): See Rapid Changeover.

LEAN GLOSSARY

SIPOC Diagram: A tool used to document the high-level map of the process; helps depict the relationships in producing products and services that meet customer requirements. Suppliers, Inputs, Process steps, Outputs, and Customers are included in this map (SIPOC).

Slowdown: This occurs when machine, equipment, or resource pools slow down, causing a process to run below its regular capacity. This differs from breakdowns based on time value; typically, less than 10 minutes. Examples include website performance slowing due to high usage or traffic slowing on the freeway during rush hour.

Spaghetti Chart: A map that shows the current layout of operations and the path taken by the product or service as it moves through the process or processes, often resembling a plate of spaghetti.

Standardization: An approach used to improve daily work; leads to the elimination of waste by setting a standard by which to improve. This is one of the approaches in the Improve Daily Work step of the Lean Pathway.

Standardized Work: The most efficient and effective combination of people, material, and equipment that is presently possible.

Start-Up: The time it takes to get started or ramped-up on an activity. Examples include time for equipment to warm-up to operating temperature or time to boot up a computer system.

Status Signaling (Andon): A warning system to signal and identify problems in the process; it is a visual control device in a production/work area, typically a lighted overhead display that gives the current status of the production system or process, and alerts supervision and team members to emerging problems. Examples include red/yellow-/green-colored lights to indicate the status of a work area (red – stop, yellow – warning, green – no problems) and a board in a call center showing the average time on hold and calls in queue.

Stoppages: Occurs when machine, equipment, or resource pools shut down, causing a process to stop. This differs from breakdowns based on time value; typically less than 10 minutes. An example is unplanned production stops or jam-ups.

Takt Time (Process Pulse): See Process Pulse.

Tree Diagram: A tool used to arrange related ideas in sequence from broad and general to narrow and specific, or in planning, from objectives to means. It is useful to map out means/actions that are needed to accomplish an overall goal and helps divide large tasks into manageable pieces.

LEAN GLOSSARY

Total Productive Maintenance (TPM or Integrated Maintenance): See Integrated Maintenance.

Types of Waste: An approach to identify waste and improvement opportunities; focuses on eight basic categories of waste and associated drivers. This is one of the approaches in the See the Waste step of the Lean Pathway.

Unevenness (Mura): One of the major drivers of waste that occurs when production, work schedule, or volume of work varies, or some parts of the process are working harder than others. Examples include batching of the billing cycle (all bills get mailed at the end of the month) and working with a machine down so another machine works at twice its usual pace to pick up the slack.

Value Stream: All the actions that are required (both value-added and non-value-added) to bring a product or service to completion.

Value Stream Map: A picture (map) of the entire value stream; includes both material (product/service) and information flows. It is a tool used to identify waste within the process and identify areas of improvement. This is one of the approaches in the See the Waste step of the Lean Pathway.

Value-Added Work (VA): Essential work that adds value to the product or service provided to customers. This type of work physically alters the product or service, customers are willing to pay for it, and it is done right the first time. Some examples include cutting, shaping, or painting a part, taking an order in a fast-food restaurant, or filling a patient's prescription.

Visual Management: A management method that uses status signaling (andon) and visual standards and controls to provide information in a clearly visible manner to both workers and managers so that the current state of operations is understood by everybody; also helps to identify problems promptly. This is one of the approaches in the Make Value Flow Faster step of the Lean Pathway.

Visual Standards and Controls: Techniques to visually monitor the process and communicate how work is to be done correctly; component of visual management (see definition). Some examples of visual standards include standardized work documentation, 5S documentation, and abnormality tagging. Some examples of visual controls include downtime indicator tracking, periodic measurements (i.e., torque, pressure, specs, etc.), and boards with data displayed on key targets (i.e., dashboards).

Waiting Waste: A form of waste that involves having to wait for another process to finish before the next activity (or set of activities) can begin. Examples include waiting to use a tool, equipment, or machine and waiting for a decision.

Warning Device: A type of error-proofing device that warns that an error has occurred in the process; signals abnormalities in the process and has an alarm and/or visual control

LEAN GLOSSARY

that signals when a part or material is out of spec or a defect has occurred. Some examples include software that confirms when a user saves or deletes work, a bell that sounds when a passenger does not have his/her seatbelt fastened in a car, and a “hot surface” light when a smooth-top stove is still warm.

Waste (Muda): Any action that does not add value to the product or service in the eyes of the customer; non-value-added activities are waste.

Workplace Arrangement: An approach focused on preparing for systematic waste reduction by making the workplace orderly, having the right tools on hand, and laying out the workspace for optimum efficiency. This is one of the approaches in the Prepare the Workplace step of the Lean Pathway.

Workplace Organization: A simple checklist approach to organize the workplace and focus on safety; also called 5S. In most organizations, it is the foundation for improvement activities. This is one of the approaches in the Prepare the Workplace step of the Lean Pathway.